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NUTRIENT AVAILABILITY AT DIFFERENT DEPTHS OF SEVERAL BLOCKS OF GOMATI DISTRICT, TRIPURA

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Abstract–The current study was carried out in the Soil Science and Agricultural Chemistry lab at Sam Higginbottom University of Agriculture Technology and Sciences. The chemical properties of Gomati District soil are influenced by soil organic carbon and pH. Accessibility to (NPK) Because of poor irrigation facilities, bad agricultural methods, climatic factors, soil texture, and low permeability. The pH of the Gomati soil is acidic to normal in nature. In Gomati soil, the EC is normal. Organic carbon was identified in the maximum sites of high to medium. In Gomati soil, available Nitrogen was determined to be medium to low. Phosphorous was detected in medium to low concentrations in Gomati soil. Potassium availability it was discovered in soil at a low level. Sulphur availability in maximum Gomati soil sites is low. Exchangeable Calcium and Magnesium were detected in high to medium concentrations at Gomati's maximum sites. It is determined that in order to improve soil health and quality, more emphasis should be placed on the role of macronutrient improvement in the soil, which would result in the highest economic output.

INTRODUCTION

The need to implement policies that safeguard environmental and ecological resources, decrease economic expenses, and promote social stability while maintaining high crop yields is one of today's major issues in agriculture (Chaudhuri *et al.,* 2016). Because it is the layer of materials in which plants grow. The link between soil and plants is complex, with one influencing the other. Soil health is essential for long-term agricultural production. Over the years, unbalanced fertiliser use, inadequate organic matter addition, and non-replacement of depleted micro and secondary nutrients have resulted in nutritional shortages and decreased soil fertility in many sections of the country, with negative consequences for the ecosystem (Madhu, 2019). Because food productivity and environmental quality are both influenced by soil physico-chemical properties, it is critical to have a fundamental understanding of these properties (Tale *et al.,* 2015). The interactions of diverse chemical elements among soil particles and the soil solution make up the chemical characteristics of the soil (Tewari *et al.,* 2016). The current study of Gomati district soil in Tripura was completed with the following chemical properties: soil pH, electrical conductivity (EC), organic carbon (OC), primary nutrients (nitrogen, phosphorus, potassium) and secondary (calcium, magnesium, sulphur) or macronutrients. Tripura, India's smallest state in the North Eastern region, has a tiny cultivable area but a lot of promise for general agriculture, horticulture, and other plantation crops (Datta *et al.,*2017). Between East latitude 91.63720 and North longitude 23.51670 is where the Gomati district is located. In Tripura's tropical climate region, the district's climate is usually warm and humid. Agriculture is the primary source of income. However, just 31.61 percent of the district's land is suitable for agriculture. The soils of the valley are medium nitrogen and humus availability. The Gomati region's soils are deficient in nitrogen and phosphates. Potash concentration ranges from low to moderate; calcium, magnesium, and sulphur levels range from low to medium; and organic carbon levels range from moderate to high in these soils (District survey report, 2019).

MATERIALS AND METHODS

Study Area

The was carried out in Gomati District of Tripura, is a hilly range, Total area of the district is 2,966 Sq.km which is about 25% of the total state area. Annual rainfall is about 2000 mm and the temperature varies between a maximum of 35.23 and a minimum of 7.43 Celsius. This research study includes 3 blocks of Gomati district i.e. Amarpur, Killa, Ampi.

Method of Soil Sampling and Laboratory Analysis

The current investigation took place between 2021 and 2022 and used multiple-site random sampling. Argo-ecosystems and their management have been investigated using a comprehensive field survey and personal observation of the study location. There are 27 in total. Soil samples were taken at three depths (0-15 cm, 15-30 cm, and 30-45 cm) from nine distinct villages .Spade and Khurpi were used to gather samples by cutting a V-shaped slice. Soil samples were delivered to the lab, air dried, ground, and sieved using a 2 mm sieve, and then stored in polybags until being used for detailed chemical analysis. Soil pH - using digital pH meter was determined in 1:2.5 soil: water ratio (Jackson, 1958), Soil EC (ds m-1) using digital EC meter (Wilcox, 1950), Soil organic carbon (%) - Determined by rapid titration method as described by (Walkley and black, 1947), Available nitrogen in soil (kg ha^{-1}) Determined through Kjeldahl apparatus (Subbiah and Asija 1956), Available phosphorus in soil (kg ha-1) Determined through Colorimeter (Olsen *et al*., 1954), Available potassium in soil (kg ha^{-1}) Determined by Flame Photometer (Toth and Prince, 1949). Exchangeable Calcium and Magnesium - By titrated with 0.01 N EDTA method or neutral ammonium acetate extraction method (Jackson), Available sulphur (ppm) determined by turbidimetric method (Bardsley and Lancaster, 1960).

Statistical analysis

The data recorded during the course of investigation was subjected to statistical analysed with the help of Microsoft excel by the CRD method of analysis of variance (ANOVA) technique (Fisher, 1960). The data on soil were analysed using ANOVA to study the effect of various agro-ecosystems, sampling period and soil depth on different soil properties and their changes.

RESULTS AND DISCUSSION

Chemical Parameters Variation at Different Depths

The soil pH increases with the increase in soil depth. The pH ranged from 5.19 to 6.29 which indicates that the soil is acidic to normal in Gomat (Reza *et al*., 2020). The electrical conductivity (EC) maximum in soil 0.17 dsm^{-1} was found at V_3 –Birganj and V_4-Baishyamani para in 30-45cm depth and the lowest value was 0.06 dsm^{-1} was found at V_2-Burburia and V_8 - chenchua (in 0-15cm depth).The highest soil organic carbon content was found at V_2- Burburia (1.05 %) in 0-15cm depth and lowest soil organic carbon content was found at V_8–Chenchua (0.36 %) in 30-45cm depth (Tiwari *et al*., 2016). The highest available nitrogen was found at V_1– Dhakaiya para (371.51 Kg ha^{-1}) in 0-15 cm depth and lowest available nitrogen was found at V_9 –Kalachan para (239.78 kg ha{ 1) in 30-45cm depth. (Chakraborty *et al*., 2020). The highest available phosphorus was found at V_4- Killa adc village (15.47 Kg ha^{-1}) in 0-15cm depth and lowest available phosphorus was found at V_3 –Birganj (8.08 Kg ha{1) in 30-45cm depth (Dey and Nath, 2015). The highest available potassium was found at V_2-Burburia (121.25 Kg ha^{-1}) in 0-15cm depth and lowest available potassium was found at V_6- Uttar Brajendranagar (68.39 Kg ha^{-1}) in 30-45 cm depth. (Datta *et al*., 2016). The highest available sulphur was found at V_6 –Uttar Brajendranagar (10.89 ppm) in 0-15cm depth and lowest available sulphur was found at V_9–Kalachan para (7.06 ppm) in 30-45cm depth (Ghosh *et al*., 2006). The highest exchangeable calcium was found at V_7- Baishyamani para (4.55 cmol (p+) kg^{-1}) in 0-15cm depth and lowest exchangeable calcium was found at V_5- Raiyabari (2.10 cmol (p+) kg^{-1}) in 30-45cm depth. (Mohd *et al*., 2021). The highest exchangeable Magnesium was found at V_3- Birganj [4.22 cmol (p+) kg^{-1}] in 0-15 cm depth and lowest

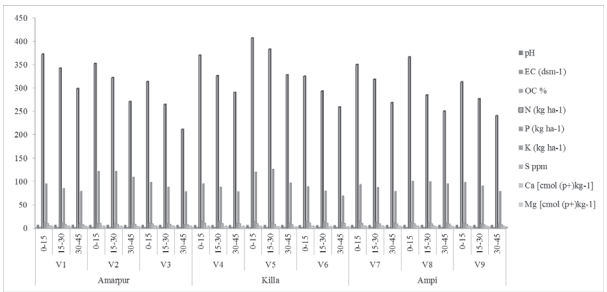

Fig. 1. Showing Variation in Chemical Parameters of soil samples of Gomati district, Tripura.

Table 1. Variation in chemical properties of soil at different villages of Gomati district.

Sites/Villages	pH	EC (Electrict conductivity) (dS m^{-1})	O.C (Organic carbon) (%)	Avl. Nitrogen (kg ha^{-1})	Avl. Phosphorous (kg ha^{-1})	Avl. Potassium (kg ha^{-1})	Available Sulphur (ppm)	Exchangeable Ca(cmol (p+) kg^{-1})	Exchangeable Mg (cmol (p+) kg^{-1})
	Range	Range	Range	Range	Range	Range	Range	Range	Range
V_1: (Dhakaiya para)	6.17-6.29	0.06-0.10	0.77-0.69	371.51-289.20	12.42-9.84	94.21-78.39	9.45-7.38	4.20-3.90	4.00-3.35
V_2: (Burburia)	6.00-6.10	0.07-0.12	1.05-0.93	351.50-270.05	10.43-8.36	121.25-108.78	9.73-8.20	3.50-3.40	4.10-2.83
V_3:(Birganj)	5.90-6.02	0.10-0.17	0.75-0.71	312.82-210.90	10.00-8.08	97.24-77.45	9.02-7.10	4.22-4.12	4.22-3.74
V_4: (Killa adc vill.)	5.59-5.52	0.09-0.10	0.87-0.82	369.54-289.95	15.47-10.11	94.31-77.36	10.16-9.18	2.33-2.24	4.13-3.90
V_5: (Raiyabari)	5.60-5.72	0.08-0.15	0.82-0.79	405.90-327.45	13.61-10.33	119.21-96.28	9.22-7.14	3.80-2.10	3.51-2.60
V_6: (Uttar Brajendranagar)	5.19-5.20	0.09-0.10	0.67-0.57	324.39-258.57	14.99-11.57	88.34-68.39	10.89-9.92	3.62-2.18	3.95-2.80
V_7: (Baishyamani para)	5.60-5.68	0.08-0.17	0.45-0.39	349.83-267. 91	14.89-11.39	92.48-78.02	9.69-8.87	4.55-3.72	4.09-3.50
V_8: (Chenchua)	5.81-5.85	0.06-0.09	0.41-0.36	365.85-249.75	12.38-11.26	100.02-94.26	9.22-8.82	4.19-3.97	3.88-3.02
V_9: (Kalachan para)	5.76-5.82	0.09-0.12	0.65-0.61	312.30-239.78	10.99-9.04	97.00-78.31	8.28-7.06	3.88-3.59	3.33-2.79

	pH		EC		OC		N		P		K		S		Ca		Mg	
	Due to depth	Due to site	Due to depth	Due to site	Due to depth	Due to site	Due to depth	Due to site	Due to depth	Due to site	Due to depth	Due to site	Due to depth	Due to site	Due to depth	Due to site	Due to depth	Due to site
F-test	S	S	NS	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
S.Ed (±)	0.299	0.027	0.034	0.024	0.588	0.031	24.581	41.742	1.67	1.419	13.411	8.384	0.890	0.677	0.705	0.283	0.347	0.379
C.D @5%	0.042	1.176	0.003	0.267	9.827	1.912	4.476	2.429	1.903	3.525	3.409	1.455	5.169	3.851	0.076	5.593	2.423	-

exchangeable Magnesium was found at V_5-Raiyabari [2.60 cmol (p+) kg^{-1}] in 30-45cm depth (Paul *et al.*,2021).

CONCLUSION

This research was successfully completed in the Gomati district of Tripura, India. It can be concluded that the soils of Gomati are in normal condition. As a result, more attention should be paid to the role of chemical condition and macronutrient improvement in the soil which would lead to maximum yield. The deficiency of some nutrients can be mitigated by use of some organic and inorganic fertilizers. The proper information about soil of any locality will assist farmers in properly monitoring their soil.

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